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SEEDS GERMINATION OF SOME ORNAMENTAL PALMS HARD TO GERMINATE
2- SEEDS GERMINATION OF *SYAGRUS SCHIZOPHYLLA* (MART.) BECC.

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ABSTRACT: *This investigation was carried out under plastic house condition at Orman Botanical Garden, Giza, Egypt throughout 2012 and 2013 seasons to examine the effect of some pregermination treatments, inculuding:control(as the seeds were directly sown without any treatment),soaking in tap water for 24 hrs., soaking in previously boiling water for 24 hrs.,mechanical scarification by either clefting with a hacksaw or rasping with a file and chemical scarfication by sooking the seeds in concentrated sulfuric acid (98.5%)for 3hrs.after remove the fleshy exocarp,on seed germination traits and seedling quality of Syagrus schizophylla ornamentel palm.*

The obtained results indicated that germination% reached the maximum (90% in the1st.season and 100% in the secand one) by rasping treatment which follwed by clefting one that recorded 90% germination in both seasons, and then soaking in concentrated H_2SO_4 for 3hrs treatment, as it gave only 70% geermation in the two seasons .soaoking in tap water for 24 hrs. recorded germination% a litte bit more then 50% in both seasons,with seeds soaked in previously boiling water failed to germinate. The least No. days to either final or 50% germination was also attained rasping treatment and followed by clefting one.

The opposite was the right regarding vigour index, seed viability and plumule length parameters which were significantly increased to the highest values, especially by the two mechanical scarification treatments . Most of treatments used in this study improved the means of leaf and leaf sheath lengths, No.leaves and roots/seedling, root length as well as fresh and dry weights of leaves and roots . Leaf content of chlorophyll a,b, carotenoids, total carbohydrates, total indoles and total phenols was markedly increased in response to the different treatments applied in such work . However, the mastership in all previous measurments was for rasping treatment that registered the highest averages at all .

So, it could be recommended to raspe the placental end of the depulped seeds of Syagrus schizophylla ornamental palm with a file for the best germination and highest quality of the produced seedlings .

Key words: *Seed germination, Ornamental palms, Syagrus schizophylla Mart., Pre-germination treatments .*

INTRODUCTION

Syagrus schizophylla (Mart.) Becc. (formerly, *Cocos schizophylla* or *Arikuryroba schizophylla*) that belongs Fam. Palmaceae is a unique Syayrus (most look just like a Queen palm) .It has a very small habit,only growing up to 2-4m height and up to 25cm thick, it's very slow especially in temperate and cold climates .It is a very neat, attractive palm with nicely arched, dark green pinnate leaves (1-2m long), leaflets widths, bright green colour,on a single plane (compared to most Syagrus which have plumose leaflets on multiple planes) Petiole very thin, about 50-80cm long, purple black, mostly in the margins, with spines near the base (this is the only Syagrus with teeth along the petiok) (Bailey, 1976).It prefers an open sunny, well drained position, but will grow in filtered light. Quite cold tolerante . It is used commonly for landscaping in the warmer climates (Huxley *et al.*, 1992) .

Syagrus species propagate by seeds that may germinate after four months . In this concern, Batista *et al.*(2011) stated that the slow and uneven germination of *Syagrus oleracea* seeds represents a problem for its propagation, especially for commercial production . Besides, Pivetta *et al.* (2013) mentioned that palm species native to Brazil such as *Syagrus picrophlla* and *S. schizophylla* have great ornamental value and for this reason are much demanded for use in landscape . Its propagation is by seeds and often presents considerable problems to nursery managers because their seeds has a hard and impermeable shell . However, seeds of Syagrus species were responsed to some pre germination treatments such as those indicated by Batista *et al.*(2011) who found that mechanical-scarified seeds of *Syagrus oleracea* sown in vermiculite germinated faster and showed higher germination (65%), as well as greater root length (16.5cm), leaf dry mass(5.1g) and root dry mass(12.4g) than non-scarified ones . A similar trend was also revealed by Pivetta *et al.*(2012) on *Syagrus picrophylla*, Shahin and Arafa(2007) on *Butia capitata* and *Hyphaene thebaica* , Mynit *et al.* (2010) on oil palm (*Elaeis guinensis*), Zarchini *et al.*(2011) on *Cyces revolute* and Pivetta *et al.* (2013) on carnanba palm (*Copernicia prunifera*) .

The present work, however aims to study the effect of some pregermination treatments on germination traits and quality of seedling produced from raising the depulped seeds of *Syagrus schizophylla* ornamental palm .

MATERIALS AND METHODS

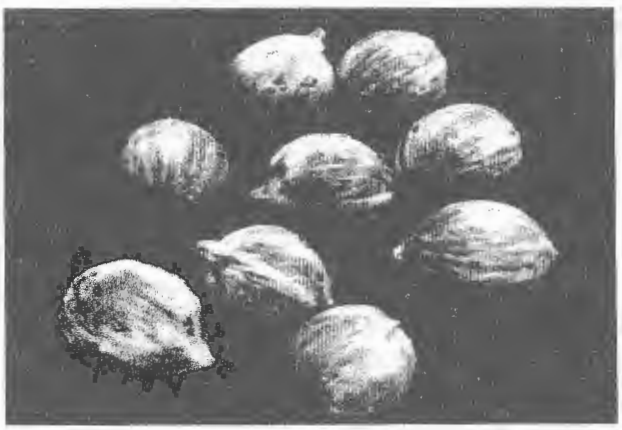
A study was consummated under plastic house condition (mean temperature and relative humidity ranged between 22-37°C and 40-75% , respectively) at Orman Botanical Garden, Giza, Egypt during the two successive seasons of 2012 and 2013 to detect the suitable treatment for elevating germination% , accelerating germination velocity and improving seedling quality of *Syagrus schizophylla* ornamental palm .

So, the globose, bright orange-yellow fruits of *Syagrus schizophylla* (Mart.) Becc. Were collecting at maturity stage (on mid of March each season) (Photo,1) and the fleshy exocarp was removed (Photo,2) . The mean weight of 10 seeds after shell removal ranged Between 45-55g .

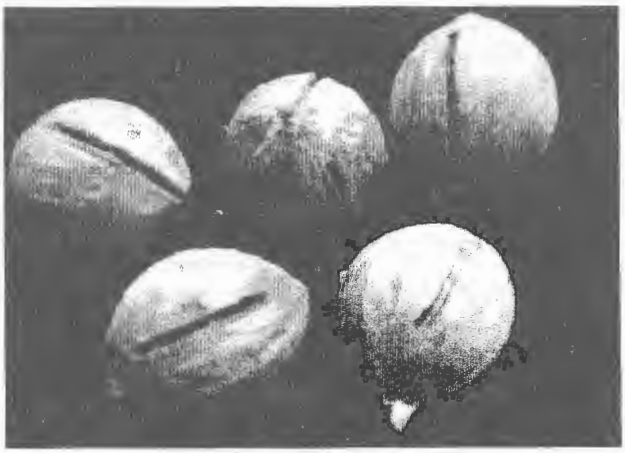
The depulped seeds were surface sterilized with a 10% solution of Na-hypochloride for 10 minutes, then rinsed several times with sterile distilled water and directly exposed to the following treatments :

1- No.treatment, referred to as control .
2- Soaking in tap water for 24 hrs.
3- Thermal scarification by soaking the seeds in previously boiling water for 24 hrs.
4- Mechanical scarification by either clefting one side of the mesocarp with a hacksaw (Photo,3) or rasping the placental round end which facing the distal pointed end with a file (Photo,4) .
5- Chemical scarification by soaking the seeds in concentrated sulfuric acid (98.5%) for 3 hrs.

Photo(1): The intact fruits



Photo(2): The depulped seeds



Photo(3): Clefted seeds

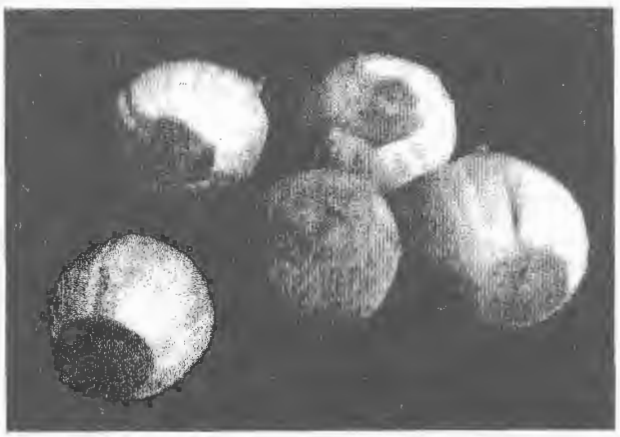


Photo (4) : Rasped seeds

Seeds of the different treatment were sown in 20-cm-diameter plastic pots filled with about 2.5Kg of an equal mixture of sand and clay . Some physical and chemical properties of the used sand and clay in the two seasons are indicated before in part,1 (Table,a) .

The experimental desgning in both seasons was entirely randomized **(Das and Giri, 1986)**, with 3 replicates, as each pot containing 5 seeds stands for one replicate . Clearly visible plumule protrusion was used as criterion for germination . All Agricultural practices needed for such plantation were done whenever required .

Mean length of plumule (cm), germination% and velocity(days), mean germination rate, in days (Odetola,1987), germination rate index (Hartmann and Kester, 1983), vigour index (Selvaraju and Selvaraj, 1994) and seed viability (Odetola,1987) were evaluated as previously explained in Part,1 of this paper .

At the end of experiment (after 180 days from sowing), seedlings of various treatments were gently dug up to measure:leaf and leaf sheath lengths (cm),number of leaves and roots/seedling, root length (cm), as well as leaves and roots fresh and dry weights (g) .

In fresh leaf samples only took from the seedling produced under the different treatments in the 2nd. season, photosynthetic pigments (chlorophyll a,b and carotenoids, mg/g F.W.) were assessed using the method described by Moran (1982), while in dry ones, the percentages of total carbohydrates (Herbert *et al.*, 1971), total indoles (A.O.A.C.,1980) and total phenols (William *et al.*,1965) were quantificated .

Data were then tabulated and subjected to analysis of variance using SAS program (1994) and Duncan's Multiple Range Test (Duncan, 1955) was employed to verify the significancy between various treatments at 5% confidence level .

RESULTS AND DISCUSSION

1. Effect of pregermination treatments on : germination and seedling growth parameters:

1. 1- Germination parameters :

From data averaged in Table (1), it can be say that germination% reached maximum (90%) in the first season by both clefting and rasping treatmens, meanwhile in the second one that was achieved by rasping treatment which gave 100% germination and followed by clefting one that recorded 90% germination . Soaking in concentrated H_2SO_4 for 3 hrs. sconed only 70% germination in both seasons . Soaking in tap water for 24 hrs. raised the mean of this trait to only 57.14% in the 1st. season and to 53.01% in the 2nd. one, whereas seeds soaked in previously boiling water failed to germinate giving 0.0% germination in the two seasons .

The least number of days to final or 50% germination was also attained by rasping treatment which followed also by clefting one . Germination rate index significantly decreased to reach the minimum by either mechanical or chemical scarification treatments, but the opposite was the right concenrning vigour index, seed viability and plumule length (cm) which were increased to the highest means in the two seasons by the two mechanical scarification treatments, with the superiority of rasping treatment that recorded the utmost high means in both seasons .

Rasping or clefting the hard shell of Syagrus seeds may directly permits the ease permeable of water and gasses across the scrape or cleft and that resulted in swelling and expand of the monocot and emergence the embryo . These results conforom with those of Batista (2011) on *Syagrus oleracea,* Pivetta *et al.* (2012) on *Syagrus picrophlla* and Pivetta *et al.* (2013) on carnauba palm .

Table (1): Effect of some pregermination treatments on some germination traits and plumule length of *Syagrus schizophylla* (Mart) Becc. palm seeds during 2012 and 2013 seasons.

Pregermination treatments	Germination (%)	Germination velocity (days)	MGR (day)	GRI	Vigour index	Seed viability	Plumule length (cm)
	First season: 2012						
Control	33.33d	120.00a	0.00	0.75a	52.00d	2.00d	1.56b
Soaking in tap water for 24hrs.	57.14c	103.25b	87.75a	0.63b	93.14c	4.00c	1.63b
Soaking in boiled water for 24hrs.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Clefting with a hacksaw	90.00a	77.67d	72.60c	0.52c	233.10a	9.00a	2.59a
Rasping with a file	90.00a	77.22d	71.80c	0.54cb	234.00a	9.00a	2.60a
Soaking in conc. H_2SO_4 for 3hrs.	70.00b	87.00c	83.80b	0.54cb	156.10b	7.00b	2.23ba
	Second season: 2013						
Control	28.80d	132.00a	0.00	0.78a	43.20e	1.67d	1.50c
Soaking in tap water for 24hrs.	53.01c	112.33b	93.50a	0.65b	84.29d	3.76c	1.59c
Soaking in boiled water for 24hrs.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Clefting with a hacksaw	90.00ab	84.70cd	79.21c	0.55c	218.70b	9.00a	2.43a
Rasping with a file	100.00a	75.48d	70.00d	0.53c	258.00a	10.00a	2.58a
Soaking in conc. H_2SO_4 for 3hrs.	70.00b	91.70c	87.10b	0.58cb	147.00c	7.00b	2.10b

- MGR: Mean germination rate and GRI: Germination rate index.

- Means within a column having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level.

1. 2- Seedling growth parameters :

It is obvious from data presented in Tables (2 and 3) that all pregermination treatments employed in such trial significantly improved the means of leaf and leaf sheath lengths (cm), number of leaves and roots/seedling, root length (cm) as well as leaves and roots fresh and dry weights (g), with few exceptions when compared to control means in the two seasons . However, the mastery in all previous characters was for the mechanical scarification treatment by rasping the hard shell with a file, as it gave the tallest leaf, the highest leaf and root number, the longest root and the heaviest fresh and dry weights of leaves and roots in comparison to control and all other treatments in the first and second seasons (Photo,5) .

Table (2): Effect of some pregermination treatments on some growth traits of *Syagrus schizophylla* (Mart) Becc. seedlings during 2012 and 2013 seasons.

Pregermination treatments	Leaf length (cm)		Leaf sheath length (cm)		No. leaves/seedling		Root length (cm)		No. roots/seedling	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Control	11.50d	10.58e	4.00b	3.68b	1.00b	1.00b	7.50c	8.40c	3.08d	3.50d
Soaking in tap water for 24hrs.	14.53c	13.34d	4.13b	3.83b	1.00b	1.00b	11.81cb	11.36b	4.85c	4.80c
Soaking in boiled water for 24hrs.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Clefting with a hacksaw	21.33ba	19.67b	4.67ab	4.31ab	2.00a	1.67a	16.20ab	15.39ab	6.26b	5.93b
Rasping with a file	24.10a	23.81a	5.33a	5.24a	2.00a	2.00a	18.00a	17.10a	7.39a	7.03a
Soaking in conc. H_2SO_4 for 3hrs.	18.79b	16.50c	4.21b	3.90b	1.00b	1.33ab	13.58b	15.21ba	5.51bc	6.20ba

- Means within a column having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level.

Table (3): Effect of some pregermination treatments on leaves and roots fresh and dry weights of *Syagrus schizophylla* (Mart) Becc. seedlings during 2012 and 2013 seasons.

Pregermination treatments	Fresh weight (g)				Dry weight (g)			
	Leaves		Roots		Leaves		Roots	
	2012	2013	2012	2013	2012	2013	2012	2013
Control	0.56d	0.61d	0.68c	0.57c	0.28d	0.31c	0.41bc	0.34d
Soaking in tap water for 24hrs.	0.67c	0.73c	0.54d	0.69c	0.35c	0.38c	0.33c	0.41c
Soaking in boiled water for 24hrs.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Clefting with a hacksaw	1.33ab	1.20ab	0.89ba	0.83b	0.67ab	0.59ba	0.54ab	0.50b
Rasping with a file	1.48a	1.39a	1.04a	1.09a	0.75a	0.67a	0.63a	0.66a
Soaking in conc. H_2SO_4 for 3hrs.	0.94b	1.05b	0.78b	0.76bc	0.48b	0.51b	0.47b	0.43c

- Means within a column having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level.

Photo (5). The best treatment compared to control

This may be reasonable because this treatment accelerates seed germination, and hence gave the seedling enough time necessary for mor growth and higher quality. Furthermore, rasping or clefting the shell gave the seed a chance to absorb more water through the scrape or cleft and that activate hydrolysis process of the complex food reseves to be absorbable by embryo (Mcdonald and Kwong, 2005).

Similarly, were those results elicited by Batista (2011) on *Syagrus oleracea*, Shahin and Arafa (2007) on Butia and Doum, Mynit *et al.* (2010) on oil palm and Pivetta *et al.* (2013) on carnauba palm .

2. Chemical composition of the leaves :

As shown in Table (4), data exhibit that leaf content of chlorophyll a,b and carotenoids (mg/g f.w.) was pronouncedly increased due to the different pregermination treatment applied in this work. That was also true regarding total carbohydrate%. The dominance in the aforementioned constituents was for the rasping treatment which gave the highest records at all . A marked increment in the leaf content of either total indoles or total phenols was also noticed in response to the various scarification treatments used in the current study. However, increment rate of total indoles content surpassed 260%, whereas that of total phenols did not exceed 160% . This may be one of the reasonable reasons for flushing seedling growth resulted from either mechanical or chemical scarification treatments more than other ones .

These results can be discussed and interpreted as done before in case of chemical composition of *Phoenix rupicola* leaves (Part, 1) .

Hence, to get the best germination and quality of the produced seedlings from commercial point of, view it is recommended to rasping the depulped seeds of *Syagrus schizophylla* with a file or clefting them with a hacksaw before sowing .

Table (4): Effect of some pregermination treatments on some constituents in the leaves of *Syagrus schizophylla* (Mart) Becc. during 2013 season.

Pregermination treatments	Chlorophyll a (mg/g f.w.)	Chlorophyll b (mg/g f.w.)	Carotenoids (mg/g f.w.)	Total carbohydrates (%)	Total indoles (%)	Total phenols (%)
Control	0.574	0.289	0.315	11.527	0.0016	0.013
Soaking in tap water for 24hrs.	0.619	0.301	0.328	12.987	0.0019	0.021
Soaking in boiled water for 24hrs.	0.000	0.000	0.000	0.000	0.0000	0.000
Clefting with a hacksaw	0.656	0.391	0.350	14.501	0.0030	0.028
Rasping with a file	0.696	0.417	0.385	15.370	0.0058	0.032
Soaking in conc. H_2SO_4 for 3hrs.	0.634	0.336	0.341	13.303	0.0026	0.028

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إنبات بذور بعض أنواع نخيل الزينة صعبة الإنبات
٢- إنبات بذور نخيل السياجرس شيزوفيللا

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الملخص العربى

أجريت هذه المحاولة بأحدى الصوبات البلاستيكية بحديقة الأورمان النباتية ، الجيزة ، مصر خلال موسمى ٢٠١٢، ٢٠١٣ لدراسة تأثير بعض معاملات ماقبل الانبات ، والتى تضمنت : المقارنة (بدون أى معاملة) ، النقع في ماء الصنبور لمدة ٢٤ساعة ، النقع في ماء سبق غليه لمدة ٢٤ساعة ، الخدش الميكانيكي إما بشق البذرة من أحد جوانبها بمنشار حدادي أو كشط الطرف المشيمي القريب بالمبرد وكذلك الخدش الكيماوي بنقع البذور في حمض الكبرتيك المركز(٩٨.٥%) لمدة ٣ ساعات علي صفات الإنبات وجودة الشتلات الناتجة من بذور نخيل الزينة سياجرس شيزوفيللا (*Syagrus schizophylla*) منزوعة اللحم .

ولقد أوضحت النتائج المتحصل عليها أن نسبة الإنبات وصلت إلي أقصاها (٩٠% في الموسم الأول ، ١٠٠% في الموسم الثانى) بمعاملة الكشط ، تلتها معاملة الشق التى أعطت نسبة إنبات ٩٠% بكلا الموسمين ، ثم جاءت بعد ذلك معاملة النقع في حمض الكبرتيك المركز لمدة ٣ ساعات والتى أعطت نسبة إنبات ٧٠% فقد بكلا الموسمين. سجلت معاملة النقع في ماء الصنبور لمدة ٢٤ساعة نسبة إنبات زادت قليلا عن ٥٠% في كلا الموسمين بينما فشلت البذور التى نقعت فى ماء سبق غليه لمدة ٢٤ ساعة في الإنبات مطلقاً بكلا الموسمين. أقل عدد من الأيام حتى الإنبات النهائى أو حتى ٥٠% إنبات حققته أيضاً معاملة الكشط بالمبرد وتلتها معاملة الشق بالمنشار . ولقد كان العكس صحيحاً فيما يتعلق بصفات دليل قوة الإنبات ، حيوية البذور وطول الريشة والتى زادت معنوياً إلي أعلى القيم ، خاصة بإستخدام معاملتي الخدش الميكانيكي (الكشط بالمبرد والشق بالمنشار). أدت معظم المعاملات التى إستخدمت بهذه الدراسة أيضاً إلي تحسين متوسطات طول الورقة ، طول الورقة ، طول غمد الورقة، عدد الأوراق والجذور/شتلة ، طول الجذر و كذلك الوزن الطازج والجاف للأوراق والجذور. كما زاد أيضا محتوى الأوراق من كلوروفيللى أ ، ب ، الكاروتينويدات ، الكربوهيدرات الكلية ، الإندولات الكلية والفينولات الكلية بشكل ملحوظ إستجابة لكافة المعاملات التى طبقت بهذه البحث. إلا أن السيادة فى جميع القياسات السابقة كانت لمعاملة الكشط بالمبرد والتى سجلت أعلى المتوسطات على الإطلاق بكلا الموسمين.

وعليه ، يمكن التوصية بكشط بذور نخيل الزينة سياجرس شيزوفيللا منزوعة اللحم بالمبرد من الطرف المشيمى القريب للحصول على أفضل إنبات وأعلى جودة للشتلات الناتجة.